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Ravensbergen, H.J.C.; Mann, D.L.; Kamper, S.J.

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Expert consensus statement to guide the evidence-based classification of Paralympic athletes with vision impairment: a Delphi study

H J C (Rianne) Ravensbergen,¹ D L Mann,¹ S J Kamper²

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¹Faculty of Human Movement Sciences, Faculty of Behavioural and Movement Sciences Research Institute MOVE Amsterdam, Vrije Universiteit, Amsterdam, The Netherlands

²Musculoskeletal Division, The George Institute, University of Sydney, Sydney, New South Wales, Australia

Correspondence to

Dr H J C (Rianne) Ravensbergen, Behavioural and Movement Sciences, Vrije Universiteit Amsterdam, Van der Boeorchstraat 9, Amsterdam 1081 BT, The Netherlands; r.ravensbergen@vu.nl

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ABSTRACT

Background Paralympic sports are required to develop evidence-based systems that allocate athletes into 'classes' on the basis of the impact of their impairment on sport performance. However, sports for athletes with vision impairment (VI) classify athletes solely based on the WHO criteria for low vision and blindness. One key barrier to evidence-based classification is the absence of guidance on how to address classification issues unique to VI sport. The aim of this study was to reach expert consensus on how issues specific to VI sport should be addressed in evidence-based classification.

Method A four-round Delphi study was conducted with 25 participants who had expertise as a coach, athlete, classifier and/or administrator in Paralympic sport for VI athletes.

Results The experts agreed that the current method of classification does not fulfil the requirements of Paralympic classification, and that the system should be different for each sport to account for the sports' unique visual demands. Instead of relying only on tests of visual acuity and visual field, the panel agreed that additional tests are required to better account for the impact of impairment on sport performance. There was strong agreement that all athletes should not be required to wear a blindfold as a means of equalising the impairment during competition.

Conclusions There is strong support within the Paralympic movement to change the way that VI athletes are classified. This consensus statement provides clear guidance on how the most important issues specific to VI should be addressed, removing key barriers to the development of evidence-based classification.

INTRODUCTION

Classification is a fundamental part of many sports. To increase the fairness of competition, athletes can be placed into classes on the basis of their gender, age (in youth sports), weight (eg, martial arts) or level of competence (eg, the handicap system in golf). In Paralympic sport, athletes are classified on the basis of their impairment to ensure that the winner is the best athlete rather than the one with the least impairment. The International Paralympic Committee (IPC) states that Paralympic classification should 'minimise the impact of eligible impairments on the outcome of competition'¹; however, the process of designing a classification system that can fulfil this objective is not straightforward. Historically, Paralympic athletes have been classified using a *medical* classification system where the class an athlete competes in is determined by a clinical

grading of their medical condition (eg, lesion level in spinal cord injury or letter-chart acuity in vision impairment (VI)). Yet there is typically no evidence to show that those different clinical gradings result in commensurate differences in sport performance. In 2007, the IPC Classification Code² was released requiring IPC member sports to develop their own evidence-based system in which athletes are classified according to the limitation in their ability to perform the sport rather than on the basis of their medical diagnosis. Here, the way in which the impairment affects performance in a sport forms the basis for classification rather than the grading of the medical condition causing the impairment.³ To develop this type of classification system, scientific evidence is required to show that athletes within each class have impairments that have a reasonably equitable impact on performance in that sport. As a result, an evidence-based classification system is necessarily sport-specific because the impact of an impairment will vary depending on the demands of the sport.

Despite the requirement for Paralympic sports to develop their own evidence-based system of classification, many sports still use a medical system. This is the case for sports that cater for athletes with VI. In fact, each of the 11 VI sports presently on the Paralympic programme continue to rely on essentially identical versions of the medical system. Irrespective of the sport, athletes currently compete in one of up to three different classes based on the WHO's criteria for low vision and blindness.⁴ This may result in unfair competition, as there is no evidence to show that (1) the impact that different VIs within one class have on sport performance is similar, but that this impact is progressively greater in each of the three classes, and that (2) the impact on performance is equitable for all sports (given that sports have different visual demands, eg, swimming vs football).

In 2011, the IPC adopted a Position Stand designed to guide classification research in Paralympic sport.¹ However, the IPC Position Stand was developed largely from the perspective of athletes with physical impairment, and in most cases does not provide guidance on how issues that are unique to VI sport should be addressed. For instance, one possible approach to equalise the impact of VI during competition would be to require all athletes to wear an eyeshade (blindfold) to ensure that the athletes all possess an equal level of impairment during competition (ie, full blindness) and so eliminate the need for further classification. Although this approach may seem appealing



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to some (and blindfolds are used by some sports), many athletes dislike them because they decrease the athlete's already limited amount of vision. The Position Stand does not address how VI sports should handle the potential use of blindfolds when designing an evidence-based classification system. Therefore, guidance is required from the athletes and other experts in VI sport so that sport federations can develop their own approach to address this and other issues.

The aim of this Delphi study was to guide the development of more effective Paralympic classification by reaching expert consensus on how issues specific to VI sport can be addressed in an evidence-based classification system. To do so, we consulted Paralympic athletes, coaches and other experts in VI using a Delphi study to (1) assess how well the current system meets the requirements of classification; (2) identify the issues specific to VI sport for which there is no guidance at present, and (3) reach consensus on how those issues should be dealt with to improve VI classification in Paralympic sport.

METHOD

Participants

A total of 25 participants (panellists) took part in the study. Panellists had to possess specific expertise in VI sport at an international level as (1) an athlete (current or recently retired), (2) coach, (3) classifier (vision specialists who allocate athletes to sport classes), (4) scientist, and/or (5) sports administrator (see [table 1](#)). To identify appropriate panellists, we consulted the IPC, the International Blind Sport Federation (IBSA) and the International Sport Federations which govern the 13 VI sports included (or preparing for inclusion) in the Paralympic programme. They provided a long list of potential candidates to serve on the panel. A selection was made from this list to provide an even representation of the five aforementioned roles,

and to ensure at least one representative from each of the 13 VI sports (athletics*, alpine skiing, cycling, equestrian, football*, goalball*, judo*, nordic skiing, rowing, sailing, shooting, swimming*, taekwondo; *represents sports with two representatives). The classifiers on the panel did not represent a particular sport. Panellists were required to possess sufficient English language proficiency to complete the online surveys.

All 25 identified experts agreed to participate and provided informed consent to the study, which was approved by the research ethics committee at the Faculty of Human Movement Sciences at Vrije Universiteit Amsterdam.

Procedure

A Delphi study provides a structured method to systematically consult a panel of experts.^{5 6} Panellists independently answered questions posed in four rounds of web-based surveys (Qualtrics Research Suite, Qualtrics, Provo, Utah, USA) over a period of 7 months, receiving summative feedback from the previous survey at each stage. The Delphi method defines consensus on the basis of a chosen proportion of the panel that agrees on a given statement. We adopted $\geq 80\%$ agreement as the level required for consensus, a threshold that is at the high end of the range for studies of this type.⁵ In case 1 or more panellists did not feel qualified to answer a given question, they could respond so and $\geq 80\%$ of the remainder of the panel was considered to constitute consensus. When the panel reached consensus for a given statement, no further questions were asked. Questions on which the panel did not reach consensus were rephrased (based on the panellists' responses to open-ended questions) and posed in the subsequent round, and/or additional questions on that topic were posed to clarify the issue.

Following the third survey, all panellists attended a 2.5-day face-to-face meeting in Amsterdam to discuss the topics on which the panel had not reached consensus. No voting took place during the meeting; rather, a fourth online survey was conducted 6 weeks after the meeting.

Panellists were given 2 weeks to complete each survey, with the analysis of responses and the preparation of the next survey taking approximately 5–6 weeks. Survey questions followed the main topics addressed in the IPC Classification Code,² the Position Stand¹ and the current VI classification procedures.^{7 8}

RESULTS

All 25 panellists completed the first round, 24 completed rounds 2–3 and 23 completed the final round. Each survey was subdivided into 12 sections (see online supplementary table S1).

Section 1: Aim of classification

The aim of classification within Paralympic sport is 'to minimise the impact of eligible types of impairment on the outcome of competition'.¹ There was consensus (88% of respondents) that the current VI classification procedures do not entirely fulfil the aim. The majority (56%) felt that this aim is currently only partially fulfilled while 32% felt that it is not fulfilled at all.

Section 2: Sport-specificity in VI classification

The IPC Classification Code requires all classification systems to be sport-specific (ie, based on the impact the impairment has on performance in that particular sport).² There was consensus that the minimum impairment criteria (ie, the lowest level of VI that makes an athlete eligible to compete) and the criteria used to divide athletes into classes should be sport-specific (83% and 87%, respectively). An implication of these findings is that the panel advocates a system in which an athlete may be allocated a

Table 1 Characteristics of the panellists

	N (%)
Sex	
Male	17 (68)
Female	8 (32)
Continent	
Africa	2 (8)
Asia	0 (0)
Europe	16 (64)
Australasia	1 (4)
North America	4 (16)
South America	2 (8)
Role within VI sport*	
Administrator	9 (36)
Athlete	8 (32)
Coach	7 (28)
Classifier	5 (20)
Other†	1 (4)
Years of experience in VI sport	
0–5	4 (16)
6–10	4 (16)
11–15	4 (16)
>15	13 (52)

*More than one answer was possible. Percentage is based on the number of individuals, not answers.

†This panellist was an optometrist with research experience who is now a classifier. VI, vision impairment.

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different sport class for each sport they wish to compete in, and may be eligible to compete in one sport but ineligible for another (if the impairment is determined to impact performance in one sport but not another).

Section 3: Eligible impairments

According to the current VI classification rules,⁷ VI can be caused by damage to the anatomical make-up of (1) the eye structure, (2) the optic nerve or pathway or (3) the visual cortex. There was consensus (95%) that damage to any of these three systems causing VI should make an athlete eligible to compete in VI sport. In the first round, some panellists raised the possibility that VIs of psychosomatic origin could be considered for inclusion (ie, a measurable impairment of vision that cannot be explained by physical damage to any structure of the visual pathway). However, the majority of the panel (79%) felt that VIs of psychosomatic origin should not render an athlete eligible to compete in VI sport.

The current VI classification rules require that a measured VI should be adequately explained by the diagnosis of an underlying health condition.⁷ There was consensus (95%) that this should remain the case, and moreover that it is necessary to improve the way that the existence of an underlying health condition is established (87%). Athletes are presently required to provide documented proof of their health condition prior to onsite classification. However, often this is not strictly enforced and athletes sometimes provide the documentation in languages other than English (the official language for classification). To ensure that an impairment is satisfactorily explained by a health condition, there was consensus (91%) that the provision of the necessary documentation should be strictly enforced by the appropriate deadline prior to on-site classification.

Section 4: Permanency of the impairment

The newly proposed IPC Classification Code states that to participate in Paralympic sport, an athlete must have an impairment that is permanent, that is, 'a condition that will not resolve in the foreseeable future regardless of physical training, rehabilitation or other therapeutic interventions'.⁹ The definition of permanency is particularly controversial in VI sport because some conditions can be corrected by surgical intervention (eg, cataract).

The panel failed to reach consensus (71% 'yes', 29% 'no') on whether an athlete should need to have a permanent VI to be eligible to compete. In the first round, two distinct scenarios were raised: (1) an athlete might wish to have treatment yet not have access, and (2) an athlete might have access to treatment but choose not to have treatment. In subsequent rounds, there was consensus (94%) that an athlete who has a treatable condition but does not have access to medical treatment should be allowed to compete in Paralympic sport. However, there was no consensus (63% agreement) on whether an athlete who has access to treatment but chooses not to be treated should be eligible to compete. Guidance on this issue is required from the IPC.

Section 5: Minimum impairment criteria

The minimum impairment criterion refers to the lowest level of VI that an athlete must possess to be eligible for competition. In the current IPC Classification Code, the minimum impairment criterion is described as an impairment that 'should limit the athlete to compete equitably in elite sport with athletes without impairment'. However, the IPC has proposed that this definition should be revised to read 'the level of impairment that has an

impact upon sport performance'. The panel supported the change as there was consensus (87%) that the newly proposed definition is suitable, but there was no consensus for the old definition (76%).

Section 6: Sport class allocation

When it has been established that an athlete is eligible to compete (ie, they meet the minimum impairment criteria), the next stage of classification is to assign a sport class to reflect the athlete's specific level of impairment. At present, athletes with VI are allocated a sport class on the basis of their visual acuity and visual field.

There was consensus (95%) that the assessment of visual acuity and visual field alone is not sufficient to appropriately allocate a sport class to an athlete. Panellists felt that these measures alone do not sufficiently capture the impact of VI on sport performance. We asked the panel to list additional measures of visual function that should be assessed. The three measures reported most often were: (1) contrast sensitivity, (2) dynamic visual acuity and/or field and (3) light sensitivity (see [table 2](#) for a full list).

Section 7: Congenital and acquired VIs

An issue raised in the first round related to whether the age at which an athlete acquires their impairment might influence the impact of that impairment on performance. Specifically, it was commented that classification might need to take this into account because the fundamental ability to acquire movement skills may be different if an impairment is present from birth (ie, is congenital) when compared to one acquired later in life. At present, the classification system does not take into account the age at which an impairment is acquired.

There was consensus (91%) that, at least in some sports, the age at which an impairment is acquired impacts an athlete's ability to acquire the skills necessary for that sport. Consensus (86%) was also reached that this is not the case in every sport. There was consensus (91%) that the relationship between the age at which an impairment is acquired and the ability to acquire skill in a sport depends on the complexity of the skills required for that sport. For instance, the movement skills required to compete in tandem cycling are likely to be less complex than those needed for swimming, and therefore in swimming (but not in tandem cycling) there might be a substantial difference in the performance of an athlete with a congenital or an acquired impairment.

However, the panel failed to reach consensus on whether classification should account for the age at which an impairment is acquired. Specifically, there was no consensus on whether the

Table 2 List of additional measures of visual function proposed to be considered for inclusion for evidence-based classification

	Measures of visual function	Panellists, n (%)
1	Contrast sensitivity	9 (38)
2	Dynamic visual acuity/visual field	8 (33)
3	Lighting sensitivity	7 (29)
4	Colour vision	4 (17)
5	Depth perception	3 (13)
6	Reaction time	2 (8)

The panellists were asked to list any measure of visual function that they thought should be assessed for the classification of athletes with vision impairment. This compiled list includes all measures that were listed by at least two panellists.

benefits of including the age at which an impairment is acquired would outweigh the complexity it adds to classification (44% 'yes' and 56% 'no'), even if there were to be evidence to show that sport performance is influenced by the age at which an impairment is acquired. There was concern that doing so would make classification too complex as it would require either (1) additional classes, or (2) different criteria for each class, depending on the age at which the impairment was acquired.

Section 8: Methods used for the measurement of VI

During VI classification, visual acuity is currently assessed using a logMAR chart and the Berkeley Rudimentary Vision Test,¹⁰ and visual fields are assessed using Goldman, Humphrey or Octopus perimetry. We asked the panel whether they were confident that the current tests of visual acuity and visual field were appropriate for the purpose of classification. There was no consensus on this issue; however, a large proportion of the panel did not feel qualified to answer these questions (see online supplementary table S1). Among the five classifiers who do have expertise in vision testing, there was also no consensus on this issue for the tests of visual acuity (60% yes, 40% no), or visual field (20% yes, 80% no). When the panel was asked to prioritise the issues for future research, establishing the most appropriate tests for visual acuity and visual field was ranked second (table 3).

Section 9: Classification rules and regulations

Currently, each eye is tested independently during classification and an athlete is allocated a sport class based on the test results for the best eye with the best possible correction (ie, with spectacles or contact lenses). There was no consensus regarding whether classification should be based on the test results from the best eye, or both eyes together. In the end, there was consensus (87%) that the decision to use the results from the best eye or both eyes together should be dependent on the sport. In some sports, it might be best to use both eyes together (eg,

football or long jump), while in others an athlete would use only one eye (eg, shooting). There was no consensus but the majority of the panel (75%) felt that the choice to classify using both eyes, or the best eye, should be sport-specific (based on what would be considered best for that sport), and applied to all athletes irrespective of whether they choose to use one or both eyes during competition.

Classification is performed with an athlete wearing their best possible optical correction (spectacles or contact lenses); however, some panellists commented that it is not always safe or possible to wear that correction during competition. However, panellists could not reach consensus on whether this requirement should be changed, with some believing that the best optical correction should only be used during classification when it can reasonably be used during competition (65%), while others felt that the rule should not change (35%).

According to IPC requirements,⁸ VI classification takes place in a room with no natural light and no large variations in luminosity. Consensus was not reached about whether the current procedure represents the most appropriate method for classification, because in some sports competition takes place outdoors in different lighting conditions to those experienced indoors. There was consensus (87%) that testing vision indoors with no natural light is appropriate for the classification of athletes who compete in indoor sports. For outdoor sports, there was consensus (95%) that testing vision indoors with no natural light is not appropriate. The majority of the panel (73%) felt that testing indoors using more realistic lighting conditions or by incorporating glare tests would be the most appropriate alternative. The remaining 27% of the panel believed that performing classification outdoors provides the most appropriate solution for sports played outdoors.

Section 10: Practical implications of the current VI classification system

Some VI sports make use of blindfolds during competition, requiring either all athletes to wear one (eg, goalballⁱ), or just a subset of athletes (eg, blackened swim goggles for athletes in the most severe VI class in swimming). There was consensus (96%) that it is not appropriate to require all VI athletes to wear blindfolds in an effort to minimise the impact of impairment on competition. However, a large proportion of the panel (77%) felt that there are some situations in which it is appropriate to make use of blindfolds in VI sport. Panellists were asked in which situations they felt it was appropriate to use blindfolds. They failed to reach consensus on whether individual sport federations should be allowed to require all athletes to wear a blindfold as a fundamental part of the sport (64%). Similarly, consensus was not reached when asking whether it is appropriate to use blindfolds to minimise the impact of impairment on competition when classification cannot entirely achieve this aim (67%).

Section 11: Intentional misrepresentation

The intentional misrepresentation of impairment, that is, when an athlete tries to deliberately convince a classifier that they

Table 3 Priorities for future research

Priority	Issue	Mean rank
1	Establishing the most appropriate measures of vision impairment to be used for classification (eg, contrast sensitivity, motion perception, or other sport-specific tests developed for classification)	2.3
2	Establishing the most appropriate tests to use in classification to reliably test existing measures of vision impairment (ie, visual acuity and visual field)	2.5
3	Establishing the most appropriate procedures to ensure that a vision impairment is supported by an appropriate diagnosis to support the level of impairment	4.2
4	Establishing guidelines for how future research should determine the minimum impairment criteria for a VI sport	4.7
5	Establishing reliable method(s) to detect the intentional misrepresentation of vision impairment	5.4
6	Establishing whether the impact of vision impairment on training is different to that of the impact on competition	5.8
7	Establishing how changes in sport rules in VI sports alter the relationship between impairment and performance	6.0
8	Establishing whether the nature of the vision impairment (congenital or acquired) differently impacts sporting performance	6.4
9	Establishing whether the use of blindfolds equalises the impact of impairment on performance	7.3

ⁱGoalball is a sport developed specifically for athletes with vision impairment. The objective is to get the ball into the goal, while the opposing team tries to block the ball with their bodies. The ball has bells inside to help the players orient themselves as to where the ball is and additionally there are tactile elements added for orientation around the court.

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have a more severe impairment than they do, represents a serious threat to the legitimacy of Paralympic competition. There was consensus (100%, excluding the 7 panellists who answered 'not sure') that, at present, some athletes are intentionally misrepresenting their level of VI. This highlights the concern of those in the sport that intentional misrepresentation is present in Paralympic sport for athletes with VI. More regular review of an athlete's classification status would make it more difficult for athletes to misrepresent their level of vision. There was consensus (88%) that athlete evaluation should take place at least every 3 years.

Section 12: Research priorities

Given the limited resources for research, we asked the panel to prioritise the most important areas for future investigation. This question was posed first in round 3, and repeated in round 4. The second time we included additional items raised by the panellists at the meeting. The top three in the list of priorities were identical in rounds 3 and 4 and even though the additional items were ranked in between the original items (at ranks 4, 5 and 7), the order of the original items in the list also remained the same. The two highest priorities were to (1) establish the most appropriate measures of visual function to be used during classification (ie, in addition to visual acuity and fields), and to (2) establish the most reliable tests for the existing measures of VI (ie, visual acuity and visual field) (table 3).

DISCUSSION

Using the Delphi method, we consulted a panel of experts to establish how issues specific to athletes with VI should be addressed in an evidence-based classification system. The results revealed a clear desire for changes in the way that athletes with VI are classified. Nearly 90% of the panel believed that the current VI classification system does not fulfil the IPC's aim to minimise the impact of the impairment on the outcome of competition.

Key issues specific to the classification of VI

The panel strongly advocated the development of a specific classification system for each sport, requiring sport-specific criteria for the minimum impairment criteria and the criteria used to allocate athletes into sport classes. Sport-specificity was also called for in VI classification when deciding (1) whether to use the results of the best eye or both eyes together when classifying athletes, (2) for the lighting conditions used during classification and (3) whether to use blindfolds.

There was a clear desire to include additional tests of visual function in the VI classification to better evaluate the true impact of an impairment on sport performance. At present, only an athlete's visual acuity and visual field are considered in classification, meaning that visual functions such as the ability to resolve contrast, moving targets and detail in the presence of glare are not taken into account. In order to address this shortcoming, tests will need to be identified to assess those functions in persons with low vision, and evidence will be required to show that those tests reliably discriminate sport performance better than what is possible using only the visual acuity and field.

One potentially simple means of equalising the impact of impairment during competition would be to require all VI athletes to wear a blindfold. However, panellists ruled this out as a means of achieving fair competition in VI sport. Some VI sports require all athletes to wear blindfolds during competition (eg, goalball), and although there was no consensus, most panellists recognised the right of those sports to use blindfolds if the sport

wished for that to continue. However, even in that case, some panellists still felt that blindfolds remained inappropriate.

Issues that hold wider implications for the Paralympic movement

Two topics on which the panel did not reach consensus have important implications for the wider Paralympic movement.

Including the age at which an impairment is acquired in classification

The first topic is whether the age at which an impairment is acquired should be included in classification. On the one hand, a congenital impairment may impede an athlete's ability to effectively learn a motor skill (particularly in the case of VI),^{11 12} and so that athlete may be at a disadvantage when compared to an athlete who has had the opportunity to learn the skill before acquiring their impairment. On the other hand, an athlete who has had the impairment from birth has had more time to adapt to their impairment, and might have refined their ability to rely on other senses to 'compensate' for their VI.^{13 14} Panellists agreed that the importance of accounting for the age at which the impairment is acquired depends largely on the complexity of the motor actions required by the sport. However, a majority of the panel (56%) was concerned that adding the age at which an impairment was acquired into the classification system would make classification overly complex and potentially lead to a decrease in sport participation. Currently, the age at which an impairment is acquired is not accounted for in the classification of any athletes in the Paralympic movement, and the issue is not addressed in the IPC Classification Code or Position Stand.^{1 2}

Permanency of impairment as an eligibility criterion

The issue of whether an impairment must be permanent to make an athlete eligible for competition proved to be contentious. Currently, the Classification Code states that the impairment should be permanent for an athlete to be eligible for competition. However, unlike most physical and intellectual impairments, some causes of VI can be treated (eg, cataract). This represents a serious challenge to the requirement for permanency as (1) treatment might be accessible for some athletes but not others, and (2) some athletes might choose not to receive treatment. These scenarios pose significant ethical and legal challenges for which the IPC will need to adopt clear stances that will apply to athletes from all three impairment groups (physical, intellectual and VIs).

What are the findings?

- ▶ An expert panel was convened and agreed that the current method of classifying Paralympic athletes with vision impairment (VI) does not fulfil the aim to minimise the impact of impairment on the outcome of competition.
- ▶ Sport-specificity is required in VI classification so that each sport has its own criteria for the minimum level of impairment necessary to compete and the criteria used to allocate athletes to a particular sport class.
- ▶ The addition of further tests of visual function (besides visual acuity and visual field) is necessary to better evaluate the impact of an athlete's impairment on sport performance.
- ▶ A requirement for all VI athletes to wear a blindfold is not an appropriate approach to achieve fair competition between athletes with different levels of VI.

How might it impact on clinical practice in the future?

- ▶ Some clinicians act as 'classifiers' whose role is to establish who is eligible to compete and the class they should compete in. This article outlines how classification is currently performed for athletes with VI, and how that role is likely to change in the future.
- ▶ Individual sports will need to work with researchers to develop their own independent classification systems and require classifiers to use this for the basis of their athlete evaluations.

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